

Sacramento Valley Groundwater Basin, North American Subbasin

- Groundwater Basin Number: 5-21.64
- County: Sutter, Placer, Sacramento
- Surface Area: 351,000 acres (548 square miles)

Basin Boundaries and Hydrology

The North American subbasin lies in the eastern central portion of the Sacramento Groundwater Basin. The Bear River is its northern boundary, the Feather River is its western boundary, and the Sacramento River is its southern boundary. The eastern boundary is a north-south line extending from the Bear River south to Folsom Lake, which passes about 2 miles east of the town of Lincoln. The eastern boundary represents the approximate edge of the alluvial basin, where little or no groundwater flows into or out of the groundwater basin from the rock of the Sierra Nevada (DWR, 1997).

The eastern portion of the study area is characterized by low rolling dissected uplands. The western portion is nearly a flat flood basin for the Bear, Feather, Sacramento and American rivers, and several small east side tributaries. The general direction of drainage is west-southwest at an average grade of about 5 percent.

Precipitation ranges from 18-20 inches in the western half of subbasin to 20-24 inches in the eastern half of subbasin.

Hydrogeologic Information

The following geologic references are presented in California Department of Water Resources. Feasibility Report, American Basin Conjunctive Use Project. June 1997.

Water Bearing Formations

The water-bearing materials of the North American groundwater subbasin are dominated by unconsolidated continental deposits of Late Tertiary and Quaternary age. Deposits include Miocene/Pliocene volcanics, older alluvium, and younger alluvium. The alluvium can be characterized as comprising the upper aquifer system, occupying the upper 200 to 300 feet of the aquifer system; the Mehrten and older geologic units can be characterized as comprising the lower aquifer system, occurring generally deeper than 300 feet towards the west. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 2,000 feet along the western margin of the subbasin. Most of the groundwater is produced in the northern portion of the subbasin. The aquifer zones in the upper 200 to 300 feet of this portion of the subbasin, appear to be unconfined and behave similarly to stresses imposed on them. Conversely, deeper zones show a delayed response to stresses in the upper zone, indicating possibly limited interconnection with the shallower zones. (DWR, 1997).

Younger Alluvium. These deposits include flood basin deposits and recent stream channel deposits. The flood basin deposits occur along the western margin of the subbasin adjacent to the Sacramento River. The flood basin

deposits consist primarily of silts and clays, although they may be locally interbedded with stream channel deposits of the Sacramento River. Thickness of the unit ranges from 0 to 100 feet. Because of their fine-grained nature, the flood basin deposits have low permeability and generally yield low quantities of water to wells. Brackish water is often encountered in these deposits.

The stream channel deposits include sediments deposited in the channels of active streams as well as overbank deposits of those streams, terraces, and local dredge tailings. These deposits occur predominantly along the Sacramento and American Rivers and their major tributaries, and consist primarily of unconsolidated silt, fine- to medium-grained sand, and gravel. Thickness of the unit ranges from 0 to about 100 feet. Sand and gravel zones in the younger alluvium are highly permeable and yield significant quantities of water to wells.

Older Alluvium. These deposits consist of loosely to moderately compacted sand, silt and gravel deposited in alluvial fans during the Pliocene and Pleistocene. A number of formational names have been assigned to the older alluvium, including the Modesto, Riverbank, and Turlock Lake Formations (Helley and Harwood, 1985), Victor and Laguna Formations (Olmstead and Davis, 1961), and Arroyo Seco Gravels, South Fork Gravels, and Fair Oaks Formation (DWR, 1974). The older alluvial units are widely exposed between the Sierra Nevada foothills and overlying younger alluvial units near the axis of the Sacramento Valley. Thickness of the older alluvium ranges between 100 to 650 feet. It is moderately permeable.

Miocene/Pliocene Volcanics. These deposits consist of the Mehrten Formation, a sequence of fragmental volcanic rocks. The Mehrten Formation is exposed along the eastern margin of the subbasin between the towns of Lincoln and Folsom. It is composed of intervals of "black sands," stream gravels, silt, and clay interbedded with intervals of dense tuff breccia. The sand and gravel intervals are highly permeable and wells completed in them can have high yields. The tuff breccia intervals act as confining layers. Thickness of the unit is between 200 and 1,200 feet.

Groundwater Level Trends

Groundwater levels in southwestern Placer County and northern Sacramento County have generally decreased, with many wells experiencing declines at a rate of about one and one-half feet per year for the last 40 years or more (PCWA, 1999). Some of the largest decreases have occurred in the area of McClellan AFB. Groundwater levels in Sutter and northern Placer Counties generally have remained stable, although some wells in southern Sutter County have experienced declines (DWR, 1997).

Groundwater Storage

Groundwater Storage Capacity. DWR American Basin Conjunctive Use Project Feasibility Report (1997) assumed a specific yield of 7% and an aquifer thickness of 200 feet for 200,000 acres within North American groundwater subbasin. Storage capacity can be estimated for the North American subbasin by applying the same assumptions as the DWR American

Basin Conjunctive Use Project Feasibility Report, specific yield of 7% and an assumed thickness of 200 feet over the entire 351,000 acre subbasin.

Groundwater in Storage. There are no published reports, which discuss groundwater in storage.

Groundwater Budget (Type B)

As part of its water planning process, DWR estimated the following components of the groundwater budget. The calculations are for a 1990 level of development. Estimated inflows include natural recharge at 83,800 acre-feet and applied water recharge at 29,800 acre-feet. There was no artificial recharge. Estimated outflows include urban extraction at 109,900 acre-feet and agricultural extraction at 289,100 acre-feet.

Groundwater Quality

Characterization. The chemistry and quality of groundwater has been assessed for the American Basin. Many areas of good quality groundwater exist in the North American subbasin. In some portions of the basin groundwater quality is marginal. The three major groundwater types are: magnesium calcium bicarbonate or calcium magnesium bicarbonate; magnesium sodium bicarbonate or sodium magnesium bicarbonate; and sodium calcium bicarbonate or calcium sodium bicarbonate (DWR, 1997).

Comparison of groundwater quality data with applicable water quality standards and guidelines for drinking and irrigation indicate elevated levels of TDS/specific conductance, chloride, sodium, bicarbonate, boron, fluoride, nitrate, iron manganese, and arsenic may be of concern in some locations within the subbasin (DWR, 1997).

High TDS levels exist in an area along the Sacramento River extending from Sacramento Metro Airport northward to the Bear River. The highest levels of TDS could be found in an area extending just south of Nicholas to Verona, between Reclamation District 1001 and the Sutter Bypass. Some wells in this area have had TDS exceeding 1,000 mg/L.

This same area along the Sacramento River extending from Sacramento Metro Airport northward to the Bear River also contains high levels of chloride, sodium, bicarbonate, manganese, and arsenic. The groundwater in the southern part of the basin is generally characterized as good quality, low in disinfection by-product precursor materials and moderate in mineral content, although some localized contamination issues do exist.

Impairments. There are three sites within the subbasin with significant groundwater contamination issues: McClellan AFB, United Pacific Roseville Rail Yard and the Aerojet Superfund Site. Although the Aerojet site lies south of the North American sub basin, a contaminant plume (including TCE and PCE) extends north from Aerojet, under the American River and into the North American subbasin (Montgomery Watson, 2000). Other localized areas of contamination exist throughout the basin and are generally smaller in scope and extent of contamination.

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Water Quality in Public Supply Wells

Constituent Group ¹	Number of wells sampled ²	Number of wells with a concentration above an MCL ³
Inorganics – Primary	265	7
Radiological	254	2
Nitrates	276	0
Pesticides	268	0
VOCs and SOCs	267	6
Inorganics – Secondary	265	75

¹ A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).

² Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

³ Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 752-2,500	Average: 800 (DWR 1997)
	Total depths (ft)	
Domestic	Range: 50-1,750	Average: 190 (665 well completion reports)
Municipal/Irrigation	Range: 77-1,025	Average: 396 (105 well completion reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	53 wells semi-annually, 7 monthly
Sacramento County		17 wells semi-annually
South Sutter WD		21 wells semi-annually, 1 monthly
Sutter County		22 wells semi-annually
DWR	Mineral, nutrient, & minor element.	32 wells biennially
Department of Health Services (including co-operators)	Title 22	339 wells

Basin Management

Groundwater management:	<p>In 1997, the American River Basin Cooperating Agencies (ARBCA) was formed by water purveyors in northern Sacramento County and southern Placer County. The primary objective of ARBCA is to develop a regional water resource management plan and conjunctive use program.</p> <p>Sacramento North Area Groundwater Management Authority (SNAGMA), is a joint powers authority responsible for the protection of the regional groundwater basin.</p> <p><i>Sacramento Metropolitan Water Authority is a joint powers authority and non-profit benefit association formed by 16 water supply agencies and utilities.</i></p> <p>South Sutter WD adopted an AB3030 plan in 1995. Placer County Water Agency adopted an AB3030 plan in 1998.</p>
Water agencies	
Public	<p>South Sutter WD, Camp Far West ID, Rio Linda WD, Citrus Heights WD, San Juan Suburban WD, Fair Oaks WD, Carmichael WD, Northridge Park County WD, Arcade WD, Western Placer ID, Placer County WA, Del Paso Manor WA, City of Sacramento WSA, City of Roseville WSA, Sacramento County Water Management District,</p>
Private	<p>Pleasant Grove – Verona MWC, Natomas Central MWC, Citizens Utility Company, Orangevale MWC</p>

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